FIG. 1

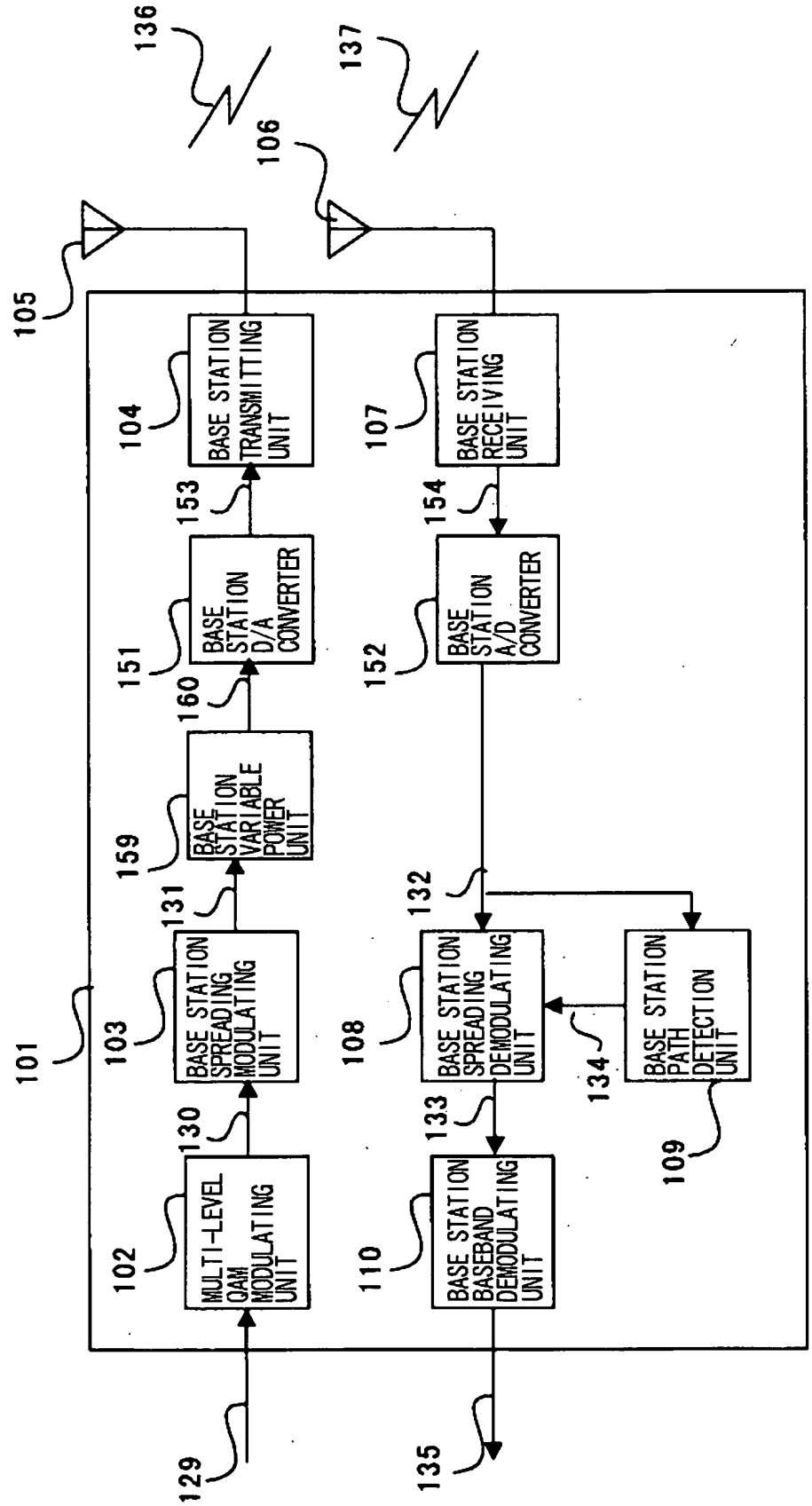

136
137
106
105
104
BASE STATION TRANSMITTING UNIT
107
BASE STATION RECEIVING UNIT
153
154
151
BASE STATION D/A CONVERTER
152
BASE STATION A/D CONVERTER
160
159
BASE STATION VARIABLE POWER UNIT
131
132
101
103
BASE STATION SPREADING MODULATING UNIT
108
BASE STATION SPREADING DEMODULATING UNIT
134
BASE STATION PATH DETECTION UNIT
130
133
109
102
MULTI-LEVEL QAM MODULATING UNIT
110
BASE STATION BASEBAND DEMODULATING UNIT
129
135

FIG. 2

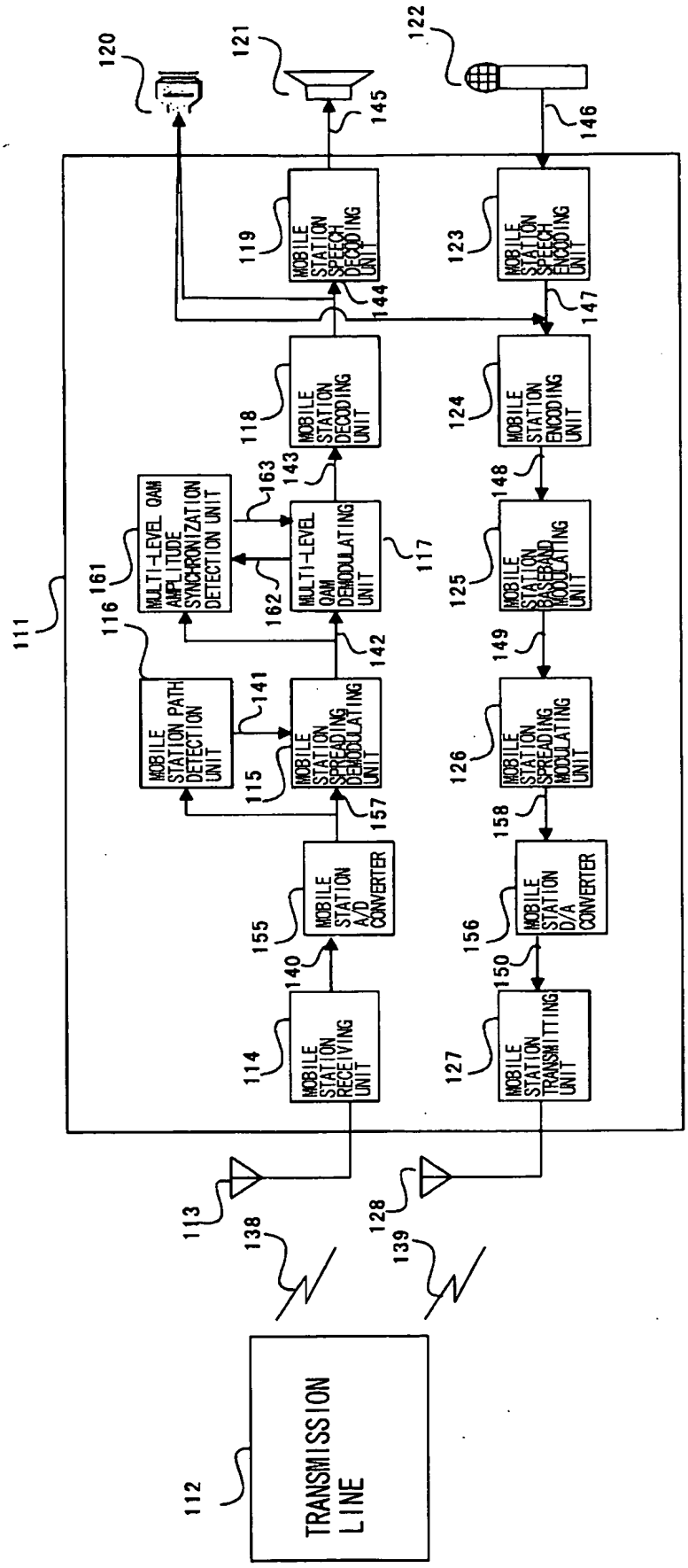

TRANSMISSION LINE
112
MOBILE STATION RECEIVING UNIT
114
MOBILE STATION A/D CONVERTER
155
MOBILE STATION SPREADING DEMODULATING UNIT
115
MOBILE STATION PATH DETECTION UNIT
116
MULTI-LEVEL QAM AMPLITUDE SYNCHRONIZATION DETECTION UNIT
161
MULTI-LEVEL QAM DEMODULATING UNIT
117
MOBILE STATION DECODING UNIT
118
MOBILE STATION SPEECH DECODING UNIT
119
MOBILE STATION TRANSMITTING UNIT
127
MOBILE STATION D/A CONVERTER
156
MOBILE STATION SPREADING MODULATING UNIT
126
MOBILE STATION BASEBAND MODULATING UNIT
125
MOBILE STATION ENCODING UNIT
124
MOBILE STATION SPEECH ENCODING UNIT
123
111
113
128
138
139
140
141
142
143
144
145
146
147
148
149
150
157
158
162
163
120
121
122

FIG. 3

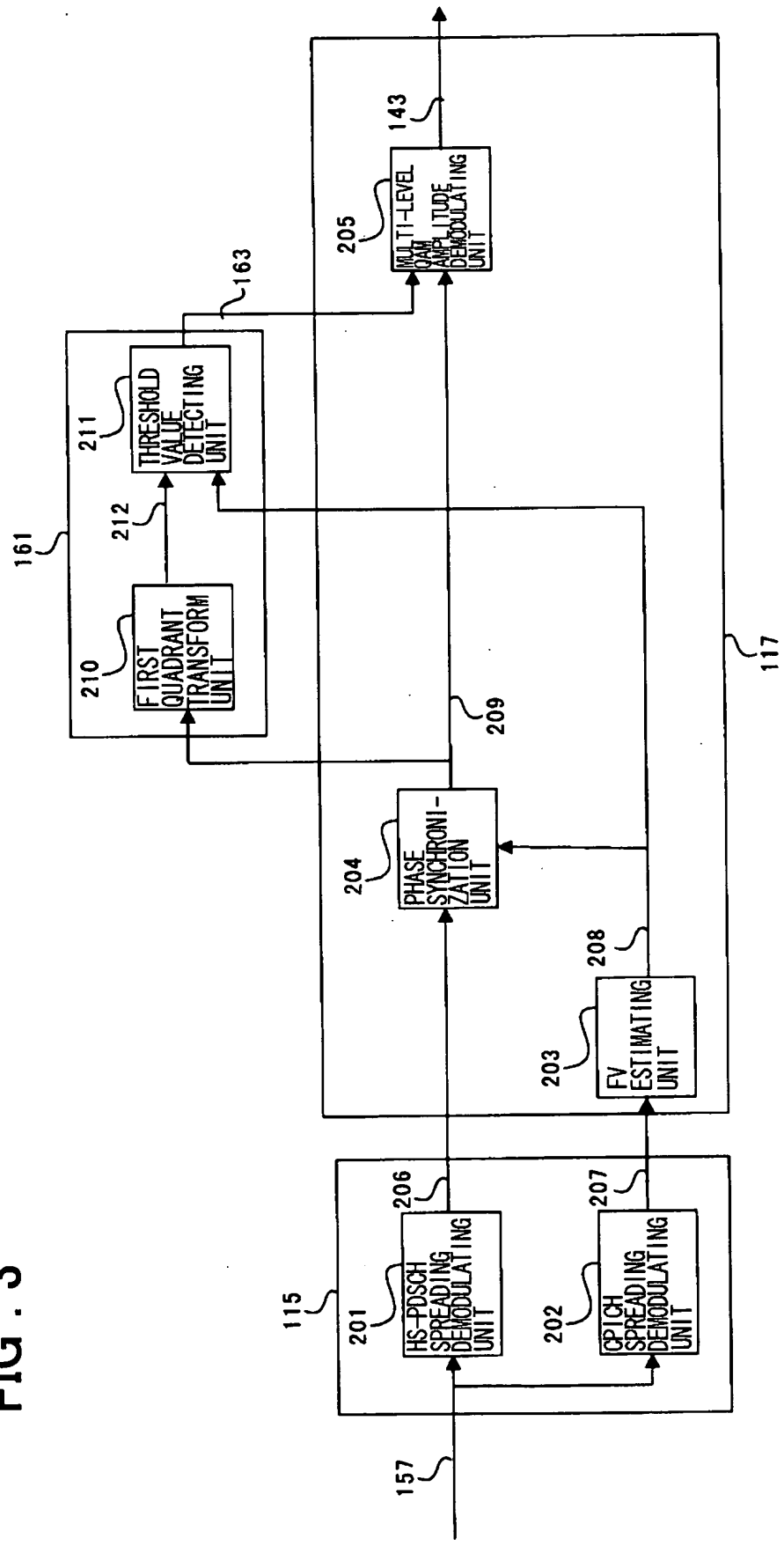

157
115
201
HS-PDSCH SPREADING DEMODULATING UNIT
206
202
CPICH SPREADING DEMODULATING UNIT
207
203
FV ESTIMATING UNIT
208
204
PHASE SYNCHRONIZATION UNIT
209
117
161
210
FIRST QUADRANT TRANSFORM UNIT
212
211
THRESHOLD VALUE DETECTING UNIT
163
205
MULTI-LEVEL QAM AMPLITUDE DEMODULATING UNIT
143

FIG. 4A

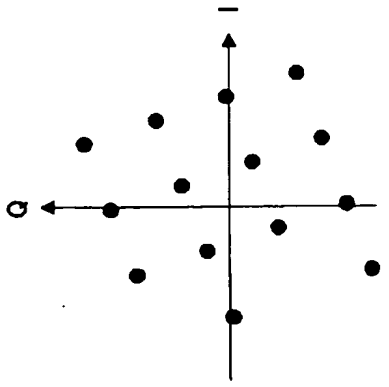
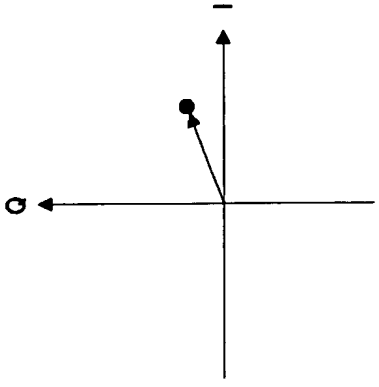
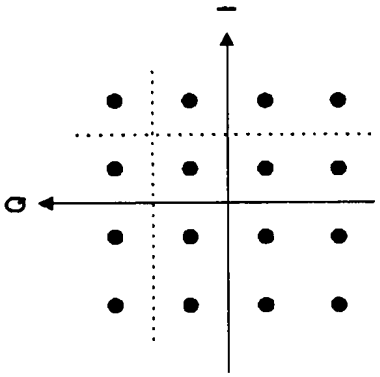


FIG. 4B



PHASE SYNCHRONIZATION

FIG. 4C



COLLECT IN FIRST QUADRANT

FIG. 4D

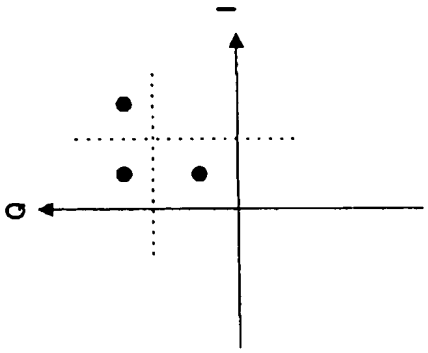
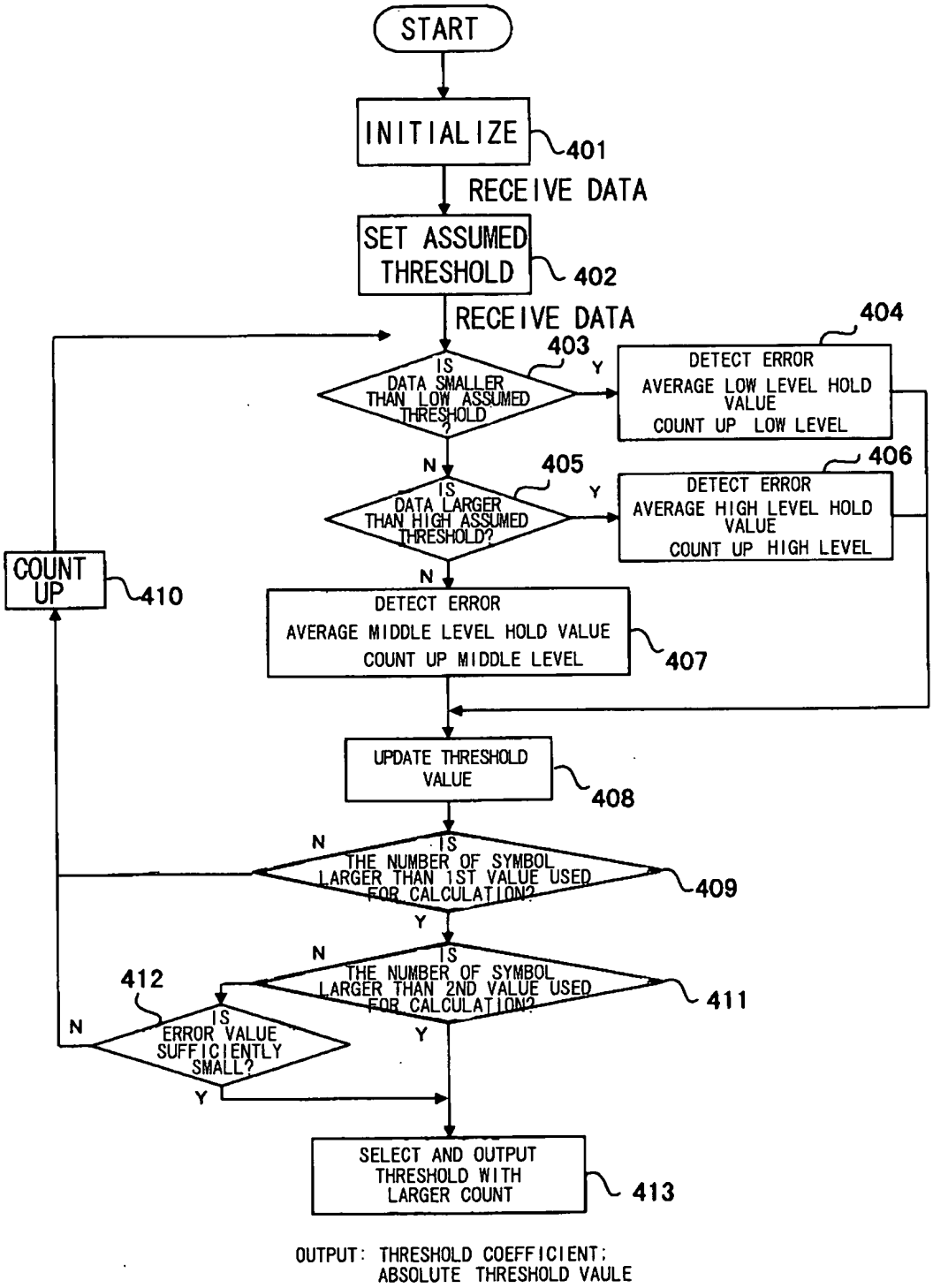
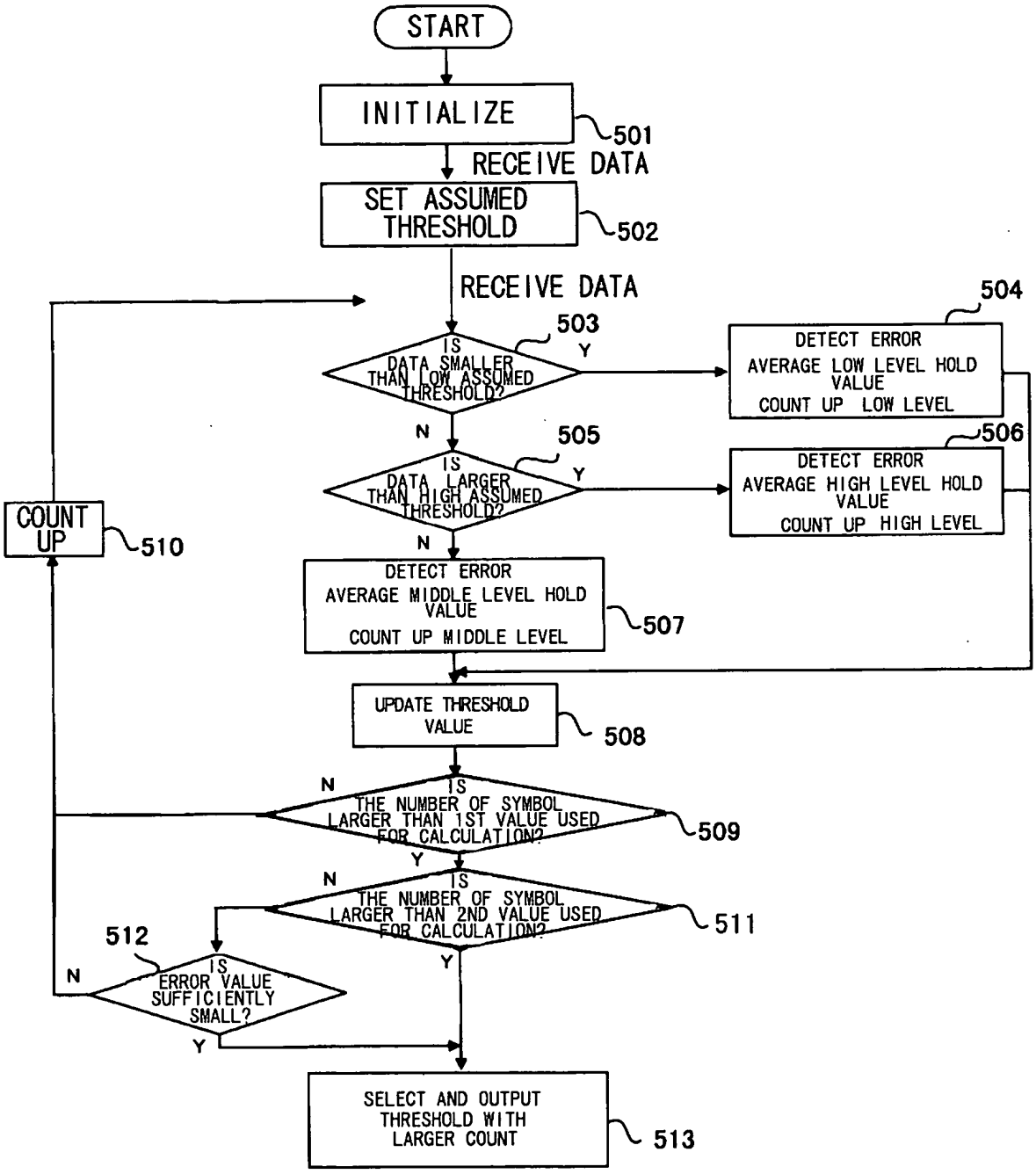


FIG . 5



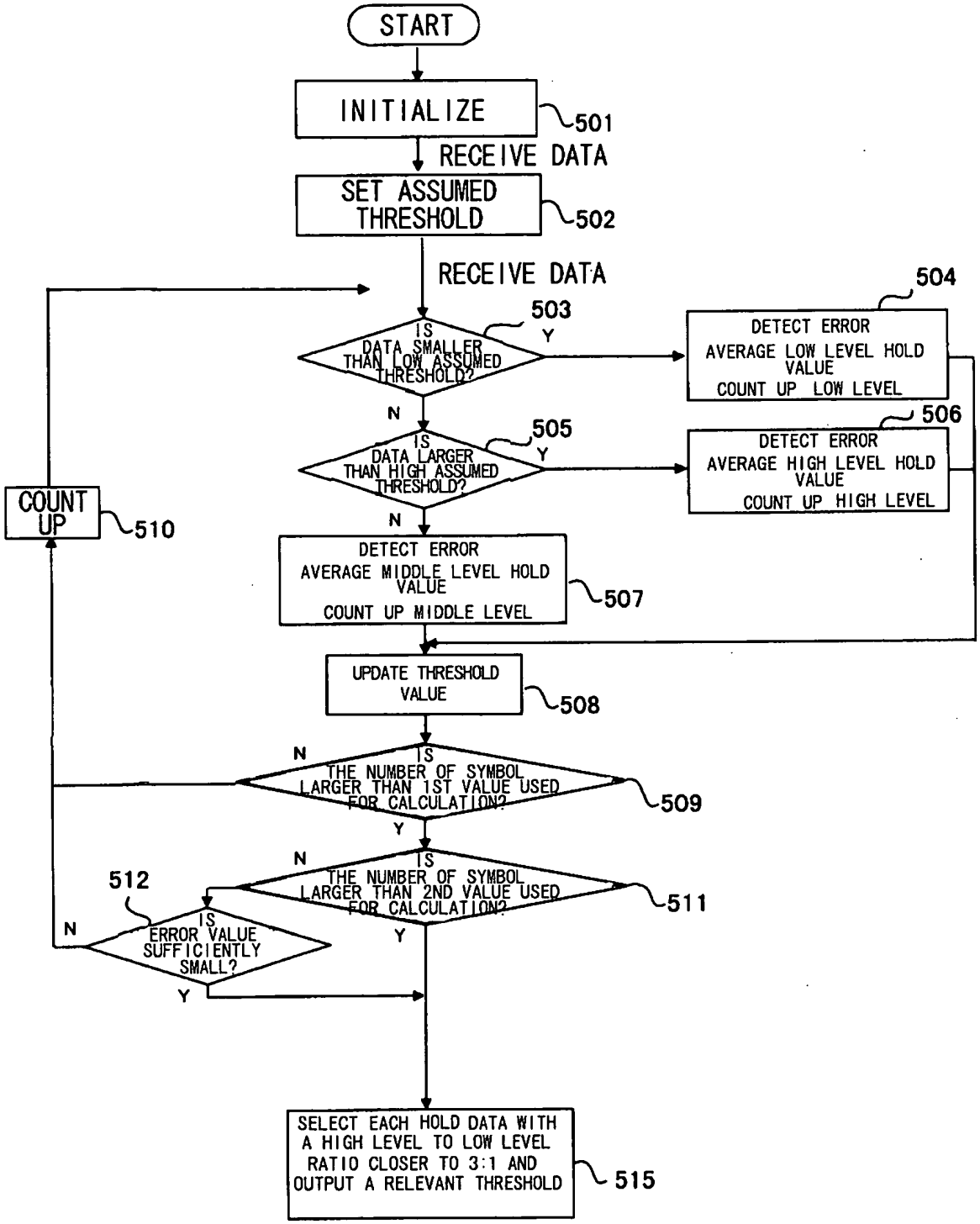
OUTPUT: THRESHOLD COEFFICIENT;
ABSOLUTE THRESHOLD VAULE

FIG . 6



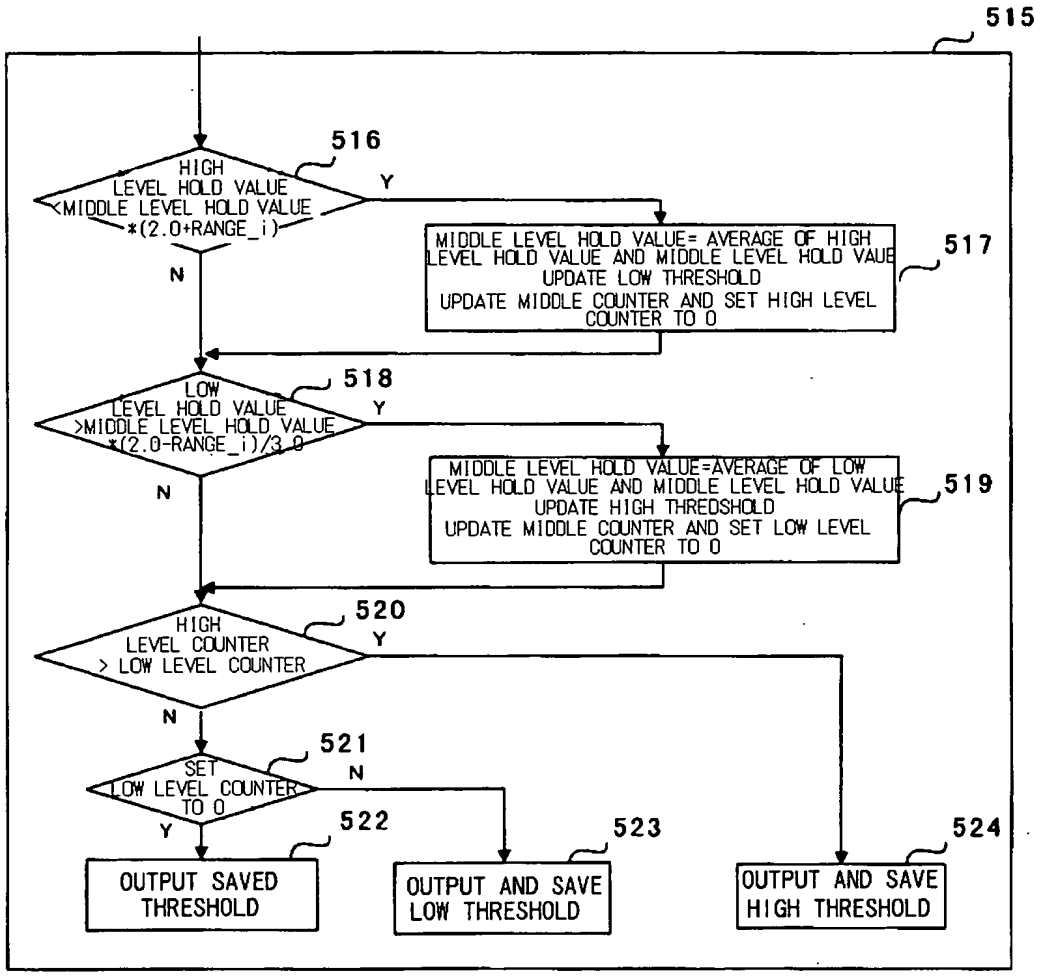
OUTPUT: ABSOLUTE THRESHOLD VALUES FOR I-AXIS
ABSOLUTE THRESHOLD VALUES FOR Q-AXIS

FIG . 7



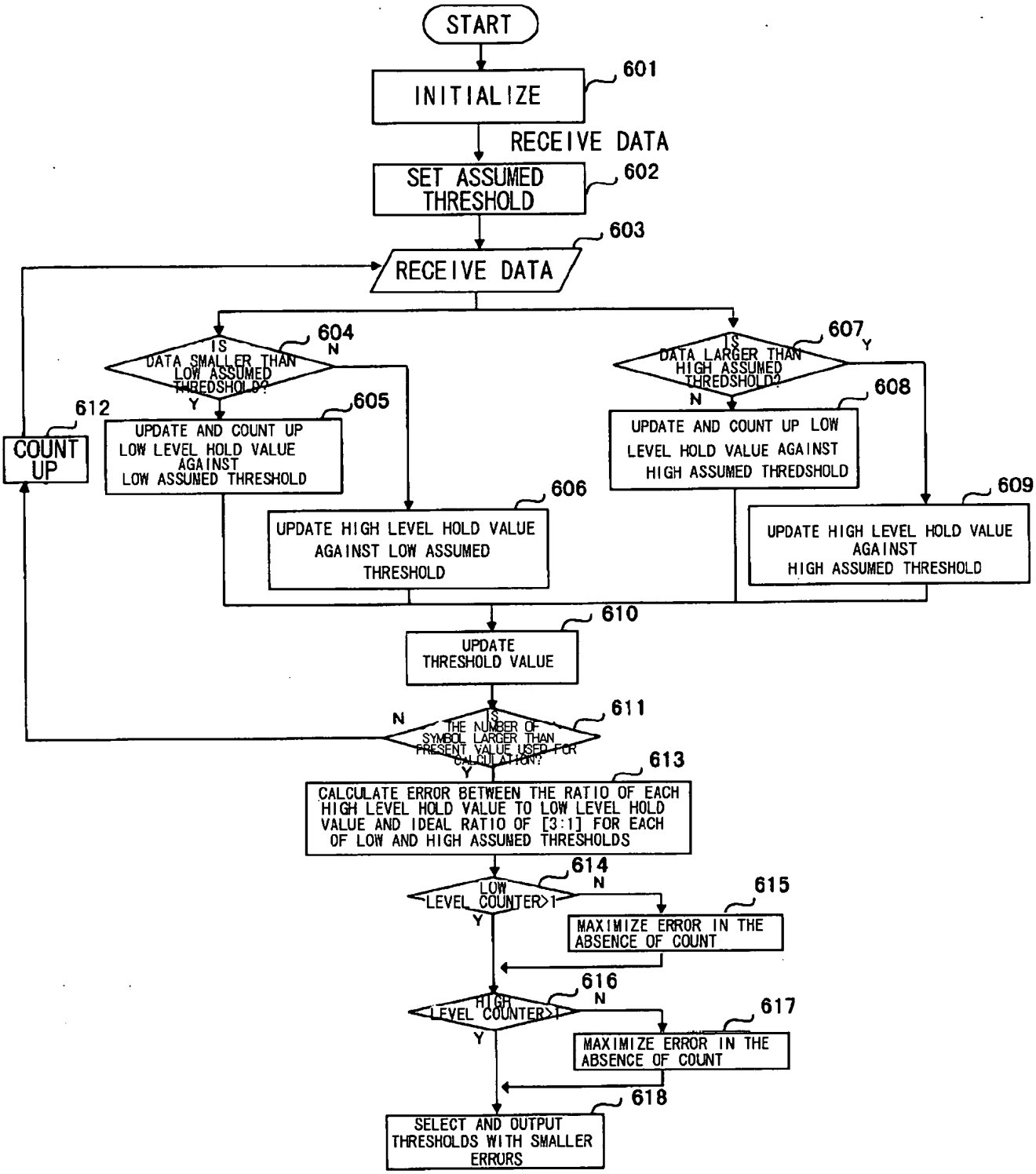
OUTPUT: ABSOLUTE THRESHOLD VALUES FOR I-AXIS
ABSOLUTE THRESHOLD VALUES FOR Q-AXIS

FIG . 8



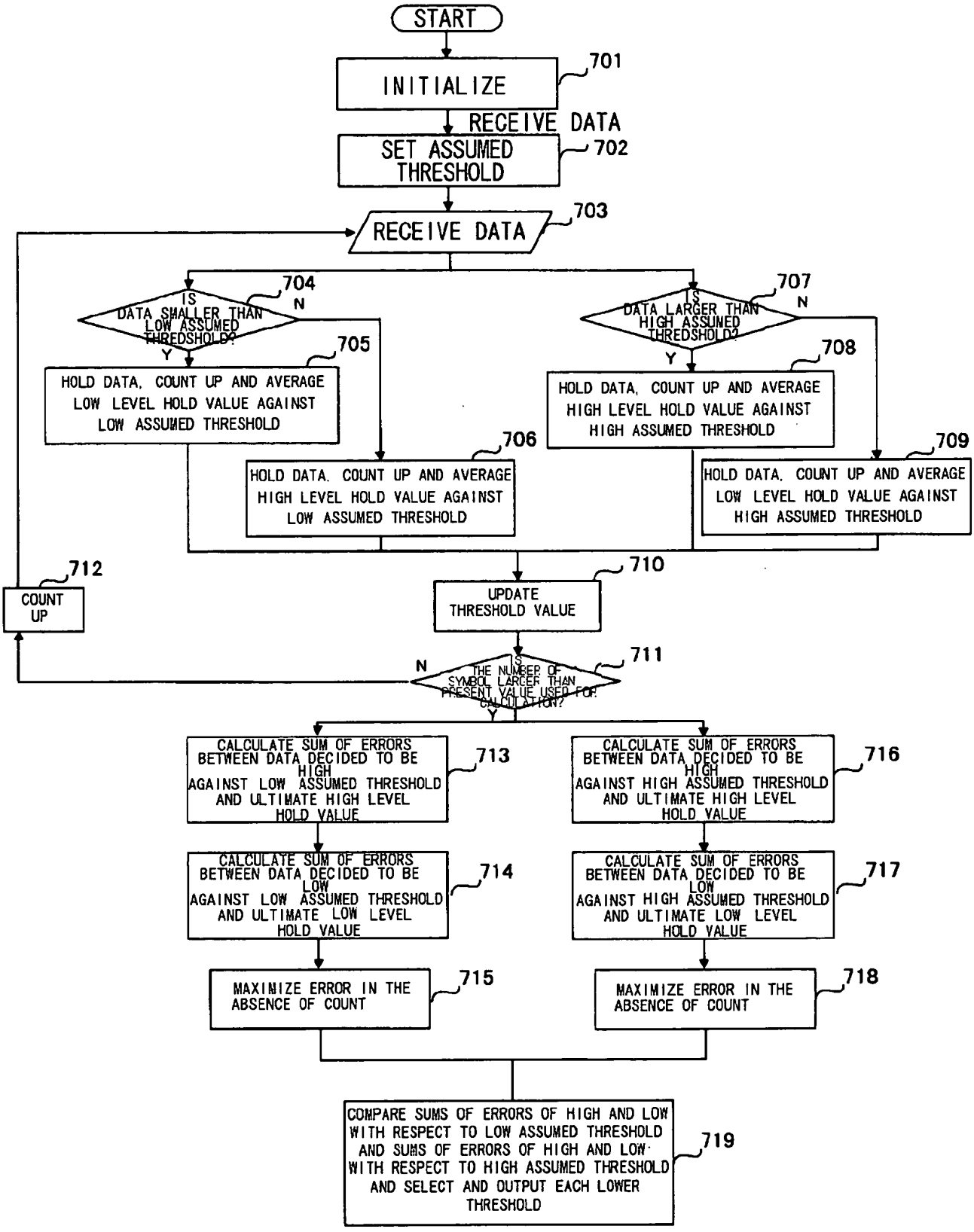
OUTPUT: ABSOLUTE THRESHOLD VALUES FOR I-AXIS
OUTPUT: ABSOLUTE THRESHOLD VALUES FOR Q-AXIS

FIG . 9



OUTPUT: ABSOLUTE THRESHOLD VALUES FOR I-AXIS
OUTPUT: ABSOLUTE THRESHOLD VALUES FOR Q-AXIS

FIG . 10



OUTPUT: ABSOLUTE THRESHOLD VALUES FOR I-AXIS
OUTPUT: ABSOLUTE THRESHOLD VALUES FOR Q-AXIS

FIG. 11A

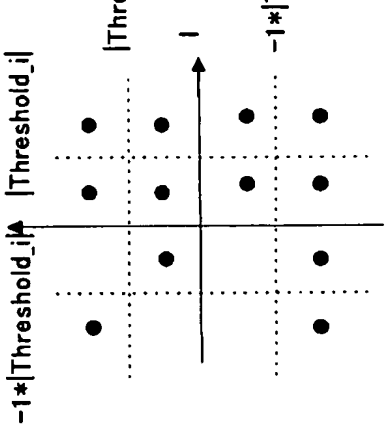


FIG. 11B

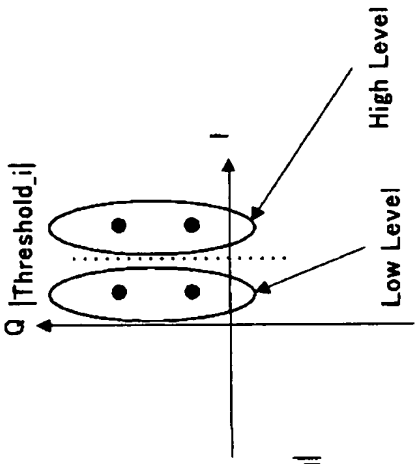


FIG. 11C

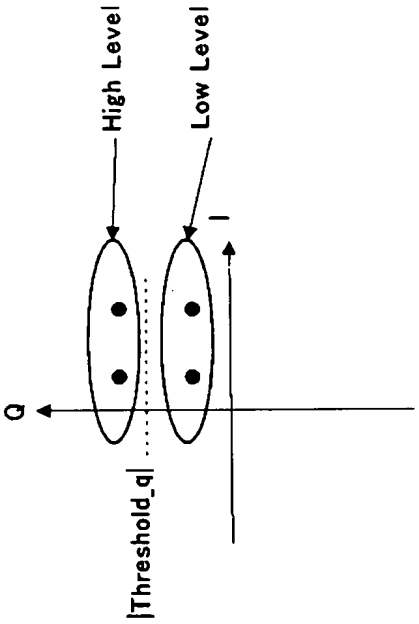


FIG . 12A

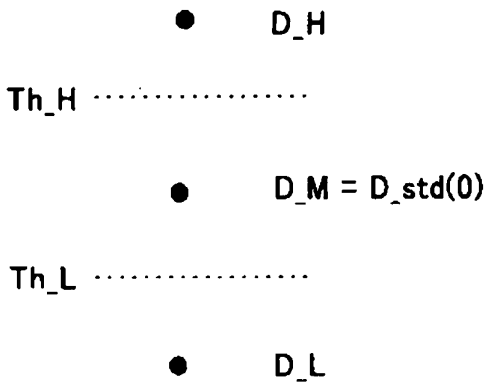


FIG . 12B

FIRST DATA D_std(0) IS Low
count_H > count_L

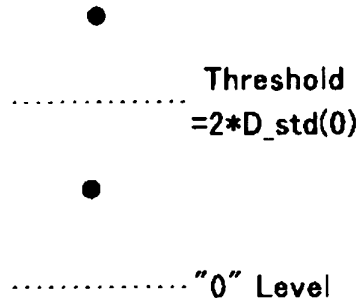


FIG . 12C

FIRST DATA D_std(0) IS High
count_H < count_L

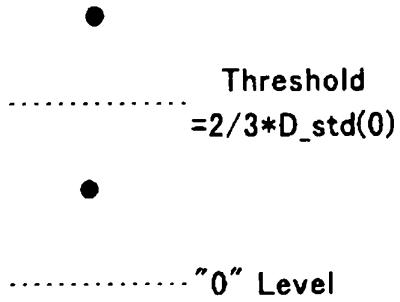
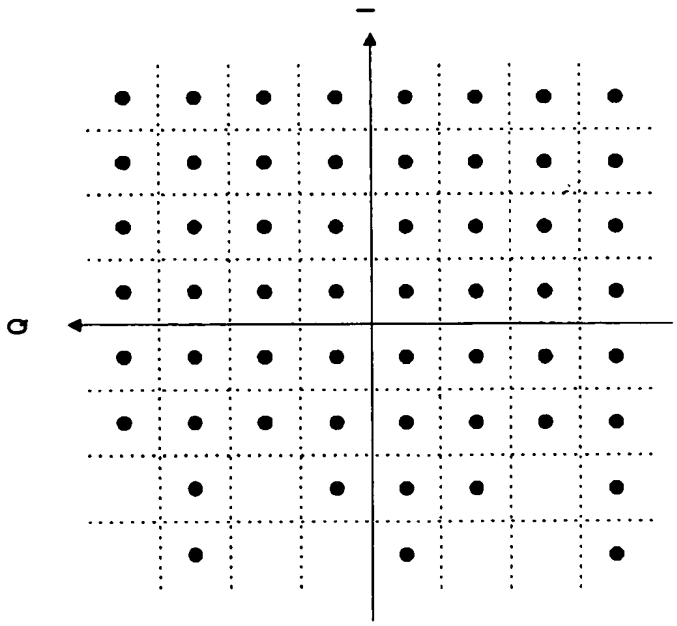


FIG. 13A



COLLECT IN FIRST QUADRANT

FIG. 13B

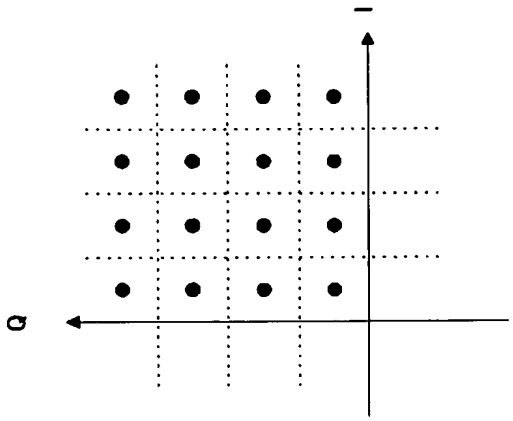


FIG. 13C

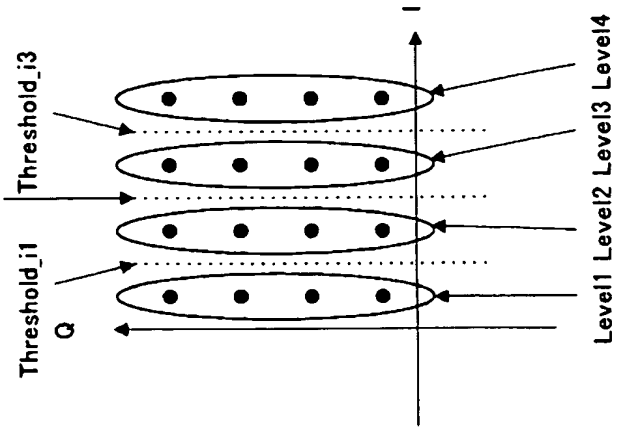


FIG .14

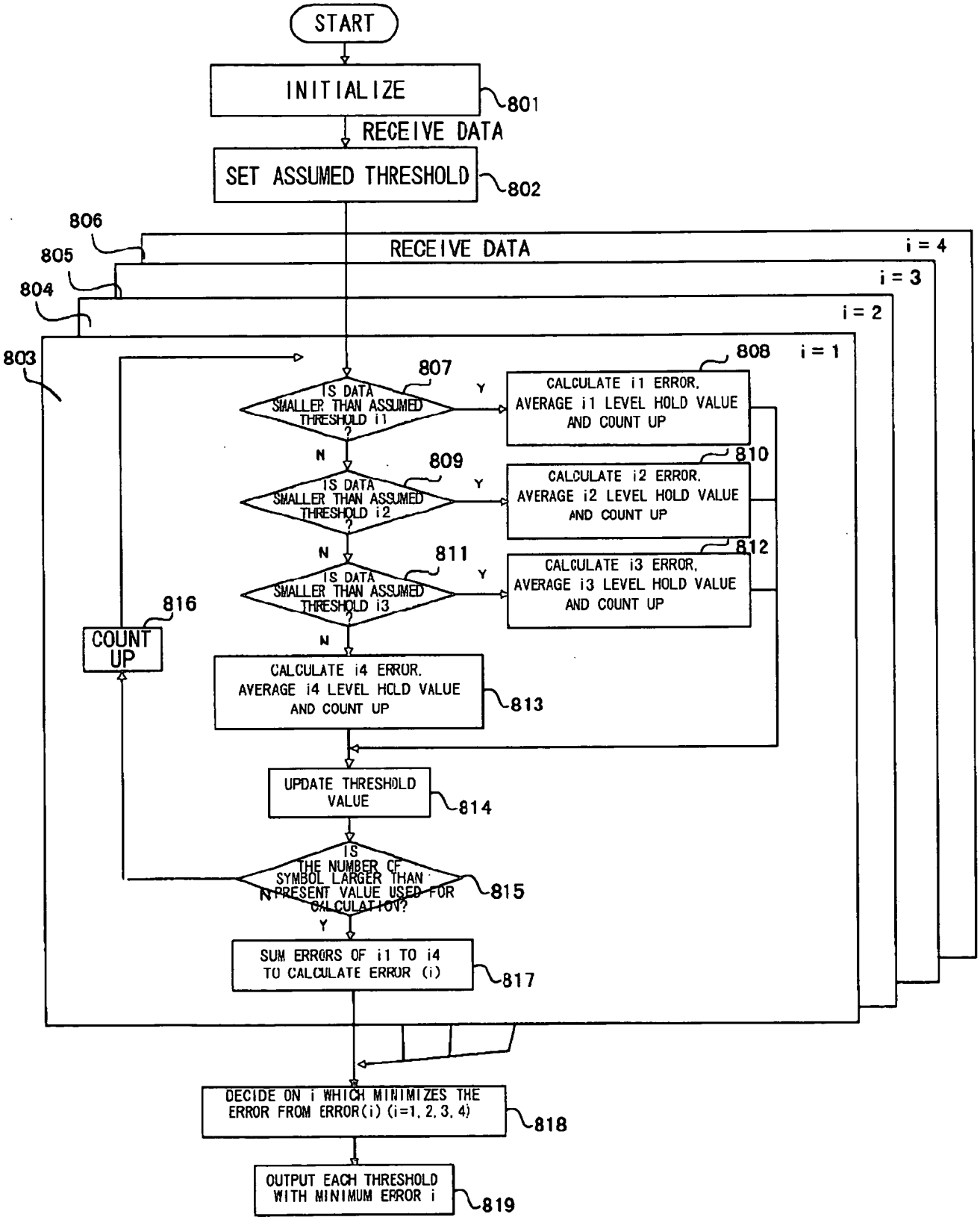

START
INITIALIZE
801
RECEIVE DATA
SET ASSUMED THRESHOLD
802
806
805
804
803
RECEIVE DATA
i = 4
i = 3
i = 2
i = 1
807
IS DATA SMALLER THAN ASSUMED THRESHOLD i1 ?
Y
N
808
CALCULATE i1 ERROR, AVERAGE i1 LEVEL HOLD VALUE AND COUNT UP
809
IS DATA SMALLER THAN ASSUMED THRESHOLD i2 ?
Y
N
810
CALCULATE i2 ERROR, AVERAGE i2 LEVEL HOLD VALUE AND COUNT UP
811
IS DATA SMALLER THAN ASSUMED THRESHOLD i3 ?
Y
N
812
CALCULATE i3 ERROR, AVERAGE i3 LEVEL HOLD VALUE AND COUNT UP
816
COUNT UP
CALCULATE i4 ERROR, AVERAGE i4 LEVEL HOLD VALUE AND COUNT UP
813
UPDATE THRESHOLD VALUE
814
IS THE NUMBER OF SYMBOL LARGER THAN PRESENT VALUE USED FOR CALCULATION?
N
Y
815
SUM ERRORS OF i1 TO i4 TO CALCULATE ERROR (i)
817
DECIDE ON i WHICH MINIMIZES THE ERROR FROM ERROR(i) (i=1, 2, 3, 4)
818
OUTPUT EACH THRESHOLD WITH MINIMUM ERROR i
819

FIG .15

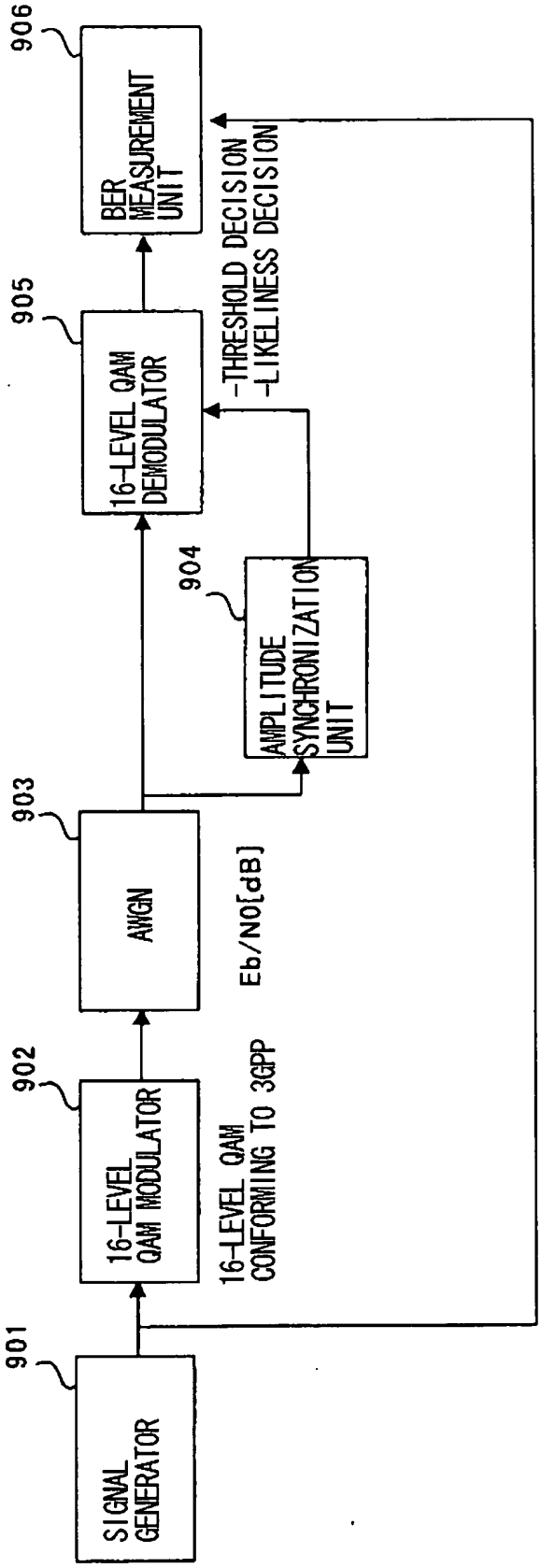

901
SIGNAL GENERATOR
902
16-LEVEL QAM MODULATOR
16-LEVEL QAM CONFORMING TO 3GPP
903
AWGN
Eb/No[dB]
904
AMPLITUDE SYNCHRONIZATION UNIT
905
16-LEVEL QAM DEMODULATOR
-THRESHOLD DECISION
-LIKELINESS DECISION
906
BER MEASUREMENT UNIT

FIG . 16A

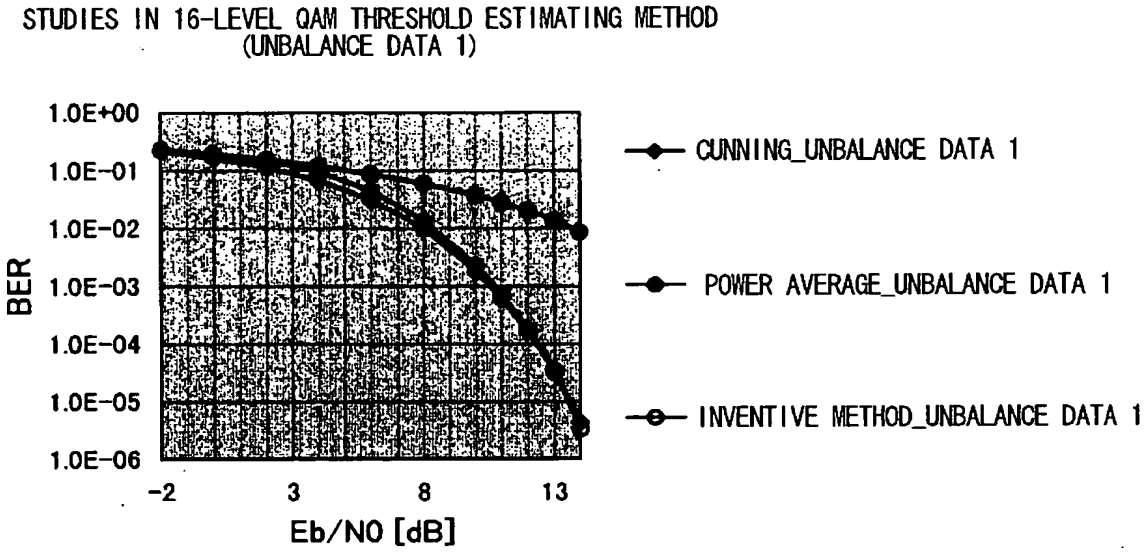


FIG . 16B

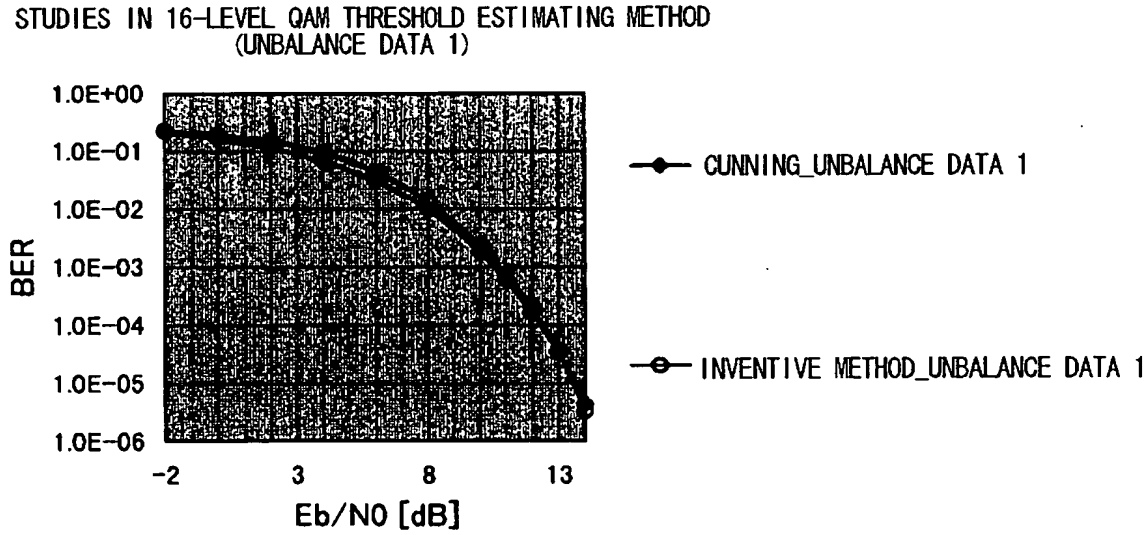
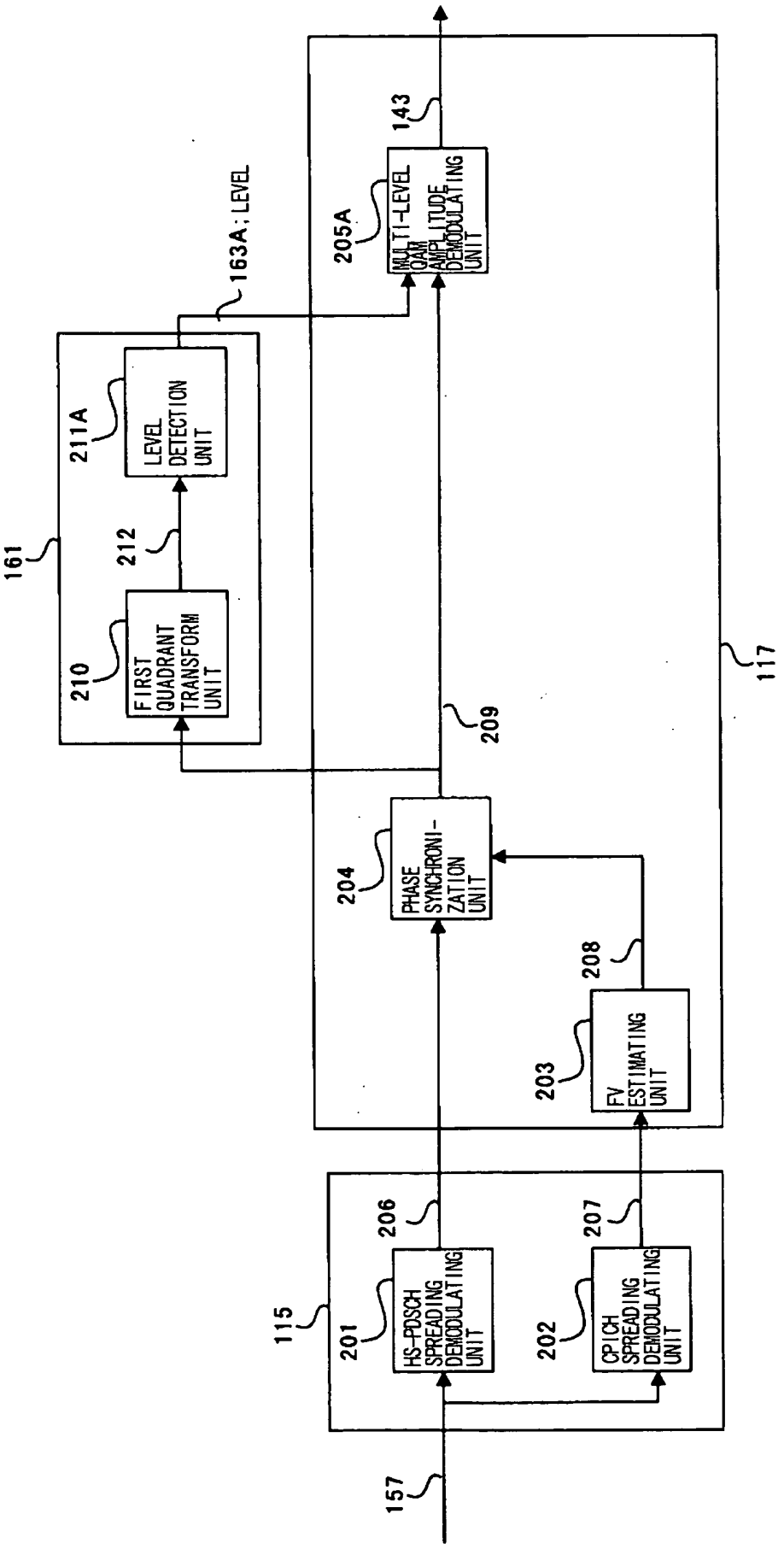


FIG. 17


157
115
201
HS-PDSCH SPREADING DEMODULATING UNIT
206
202
CPICH SPREADING DEMODULATING UNIT
207
203
FV ESTIMATING UNIT
208
204
PHASE SYNCHRONI-ZATION UNIT
209
117
205A
MULTI-LEVEL QAM AMPLITUDE DEMODULATING UNIT
143
163A; LEVEL
161
211A
LEVEL DETECTION UNIT
212
210
FIRST QUADRANT TRANSFORM UNIT